PERFORMANCE OF EARLY GENERATIONS OF SOME INTRA- AND INTERRACIAL POPULATIONS OF COMMON BEAN

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Five parents from each of four groups of common bean were hybridized within and among groups to produce 50 crosses. Thus, 20 crosses within four groups and 30 crosses among four groups were made. Three groups came from races Mesoamerica, Nueva Granada, and Chile. The fourth group had two parents of race Jalisco and three of race Durango. Three of the interracial F_1 hybrids were dwarfs. The remaining 47 F_1, 47 F_2, and 20 parents were evaluated at CIAT-Palmira and Popayán in 1990, and 20 parents, 47 F_2, and 47 F_3 were evaluated in 1991. Data were recorded for seed yield, 100-seed weight, harvest index, dry matter, flowering duration, seed-filling duration, and days to maturity. Percent heterosis over the high parent, inbreeding depression, heritability based on parent-offspring regression, expected and realized gains from selection (at 20% selection pressure), and correlations among generations were calculated.

Mean seed yield, dry matter, flowering duration, and days to maturity of Middle American races Mesoamerica, Durango, and Jalisco were higher than those of Andean races Chile and Nueva Granada. The latter two had higher seed weight. The highest heterosis and F_1 hybrids yielding significantly higher than the high parents and the control cultivars were found in interracial crosses. However, there was a sharp reduction in yield due to inbreeding from the F_1 to F_2. Crosses within and among Middle American races Durango, Jalisco, and Mesoamerica yielded higher than those within and between Andean races Chile and Nueva Granada. Significant ($P < 0.01$) and positive correlations were found for seed yield among the mid-parental value, F_1, F_2, and F_3 (Table 1).

Heritability values determined by the regression of the F_3 on F_2 were moderately high for 100-seed weight and days to maturity (Table 2). Estimates for all other traits, including seed yield and seed-filling duration, were comparatively lower. Expected (F_2) and actual gains (F_3) at 20% selection pressure were the lowest for days to maturity and the highest for 100-seed weight, followed by seed yield, dry matter, and flowering and seed-filling duration. Thus, substantial gains could be made for seed yield and other traits by evaluation and selection among population bulks in early generations of common bean.

Table 1. Correlation coefficients among early generations of common bean populations grown at Palmira and Popayán, Colombia in 1990 and 1991.

Generations	Seed yield	100-seed weight	Harvest index	Dry matter	Flowering duration	Seed-filling duration	Days to maturity
Mid-parent & F_1	0.60**	0.92**	-	-	0.55**	0.65**	0.86**
Mid-parent & F_2	0.78**	0.95**	0.66**	0.72**	0.83**	0.73**	0.93**
Mid-parent & F_3	0.69**	0.94**	0.43**	0.68**	0.92**	0.41**	0.87**
F_1 and F_2	0.83**	0.96**	-	-	0.78**	0.82*	0.92**
F_1 and F_3	0.65**	0.93**	-	-	0.50**	0.11	0.79**
F_2 and F_3	0.78**	0.98**	0.60**	0.78**	0.82**	0.33*	0.88**

*,** Significant at P = 0.05 and P = 0.01, respectively.

Table 2. Heritability[a] obtained from the regression of the F_3 on F_2 and expected and actual gains from selection for seed yield and other traits in common bean grown at Palmira and Popayán, Colombia, in 1990 and 1991.

	Seed yield		100-seed weight		Harvest index		Dry matter		Flowering duration		Seed-filling duration		Days to maturity	
	Palmira	Popayán	Palmira	Popayán	Palmira	Popayán	Palmira	Popayán	Palmira	Popayán	Palmira	Popayán	Palmira	Popayán
Heritability	0.29 ± 0.10	0.51 ± 0.09	0.61 ± 0.05	0.61 ± 0.02	0.42 ± 0.12	0.51 ± 0.15	0.44 ± 0.1	0.49 ± 0.1	0.48 ± 0.08	-	0.38 ± 0.13	0.36 ± 0.10	0.55 ± 0.06	0.57 ± 0.06
Gains[b]														
Expected (F_2)	6.1	14.2	20.8	27.8	4.3	3.3	6.8	14.3	9.4	-	5.3	5.6	3.7	3.1
Actual (F_3)	16.3	19.3	33.9	42.0	8.5	6.6	15.8	18.4	14.3	-	11.2	5.8	5.2	4.9

[a] According to Smith and Kinman, Crop Sci. 5:595-596 (1965).
[b] % of population mean at 20% selection pressure.